Energy Facts

Solar Trough

Solar troughs are considered "line-concentrators" because a long parabolic reflector concentrates the sun's radiation onto a specialized receiver tube. The radiation heats a fluid inside the receiver tube, usually to around 700º F. The collector field is comprised of many rows of the mirrored parabolas, aligned on a north-south axis. A single-axis tracking device enables the line of mirrors to follow the sun and illuminate the receivers from sunrise to sunset. Once at temperature, the heat transfer fluid is pumped from the collector field to a heat exchanger where water is converted to steam. As in a conventional thermal power plant, the steam drives a steam turbine, generating electricity.

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History:

Solar troughs have been generating energy in California for more than 20 years. The original solar electric generating systems (SEGS) plants were designed and built from 1986-1990 by Luz Industries after the oil shocks of the '70s. Located in the Mojave Desert, the nine original plants still produce 354 MW of electricity, enough to power 150,000 homes.[1] New advances since the 80's have enabled these plants to produce 40% more electricity than when they were first constructed.

Nevada Solar One, in El Dorado Valley, NV, is the first large-scale solar trough plant developed since 1990. The plant consists of a 300-acre collector field composed of largely recycled aluminum frames, 760 parabolic concentrators, and over 18,000 solar receivers. It has a capacity of 64 MW and is expected to supply 134 million kWh of electricity/year at a price of $.15 - $.17/kWh.[2] As of November 2007, the California Energy Commission had 350 MW of solar trough projects in its permitting process.[3] For comparison, Spain is currently on track to reach a capacity of 500 MW of solar thermal power (mostly trough, but also tower) by 2010. Other trough projects have been announced in Israel, Egypt, Australia, and Algeria.[4]

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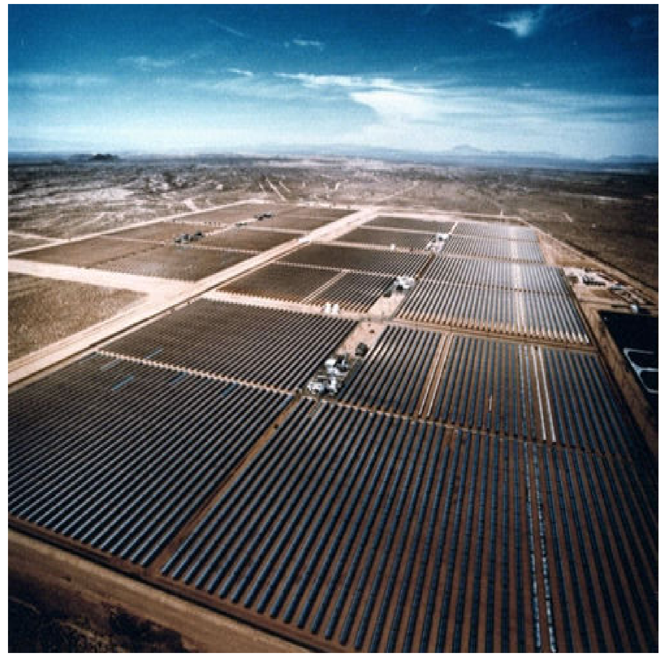
Solar Trough

Land Use:
Trough plants require level land, with less than one percent slope desirable , and sites are typically graded. Trough technology requires approximately 4-5 acres/MW of capacity, or 300 acres for the 64 MW Nevada Solar One.



150 MW plant at Kramer Junction, CA

Water Use:
Like all steam turbines, trough plants require water in order to generate the steam that powers the turbine. The technology employs closed-loop circulation but requires some "make-up" water to replace water lost in the system. Some water is also required to regularly wash the mirrors to maintain high efficiency. If wet cooling is used, as is the case for Nevada Solar One, water is also required for the cooling towers in amounts similar to conventional steam plants, about 600 acre-ft/year per 100 MW. Although dry cooling would use significantly less water, about 18 acre-ft/year per 100 MW, it has not been proposed for any trough plants in California due to economic factors. However, several developers have indicated that they are involved in discussions with nearby cities to use reclaimed sewer water. For comparison, one acre-ft/year of water is enough for 3-6 families in California.

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[1]Woody, Todd. "Big Solar's day in the sun", Business 2.0 magazine. June 2007. Available at: http://money.cnn.com/magazines/business2/business2_archive/2007/06/01/100050990/index.htm
[2]Lacey, Stephen. "Tracking the Sun: Concentrating Solar Power faces bright future." Renewable Energy World, March 20, 2007. Available at: www.renewableenergyweekly.com
[3]California Energy Commission, "Large Solar Energy Projects" last updated 11/07 Available at: http://www.energy.ca.gov/siting/solar/index.html
[4]Jackie Jones. Renewable Energy World. "CSP lifts off: Nevada Solar One comes to life" May 2007. Available at: http://www.renewableenergyworld.com

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